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The climate research agenda after Paris: should '1.5 degrees' change anything?

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(final accepted version)

The Paris Agreement contains an ambition to limit global warming to no more than 1.5°C above pre-industrial levels, changing the context for policy-relevant research and extending a challenge to the IPCC and researchers.

Introduction

To some commentators' surprise, the Paris Agreement reached last December under the auspices of the UNFCCC included the explicit intention to "pursue efforts to limit the [global] temperature increase to 1.5°C above pre-industrial levels". Given that countries' stated ambitions, in the form of the Intended Nationally Determined Contributions (INDCs) fall well short of limiting warming to 2°C[1], let alone to 1.5°C, one might wonder whether negotiators were whistling in the dark.

Accompanying the Agreement, however, was an invitation from the Conference of the Parties to the IPCC. It requested the IPCC to "provide a special report in 2018 on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways". In inviting this report, governments are effectively asking the IPCC to explain some of the implications of what they have already agreed.

The significance of this invitation from the world's governments to the IPCC is twofold. First, the IPCC is being asked to 'identify a level' to which annual emissions should be reduced by 2030 to offer the prospect of just 1.5°C of warming, a level presumably well below the 40GtCO2 that is deemed necessary for securing 2°C with reasonably likelihood. Second, the impacts of a 1.5°C warming identified by such an IPCC report would be important for discussions about the Warsaw International Mechanism for Loss and Damage. The scale of these prospective climate change-induced damages would act as a minimum baseline against which potential flows of adaptation support and finance might be judged.

Such a request raises important questions about the relationship between knowledge and policy, highlighted here. Specifically, the UNFCCC's invitation raises the issue of whether the IPCC is in a position to deliver such a report in 2018 and, if so, whether its assessment would be useful and robust. More generally, the invitation refocuses attention on the function and status of the IPCC as an institution which mediates between climate science, governance and policy and, more broadly, questions how the interactions between knowledge and values in environmental geopolitics are conceived and navigated[2].

An IPCC Report on 1.5°C

It is entirely appropriate for the Conference of the Parties to the UNFCCC to ask the IPCC to prepare a report with stated objectives. After all, the IPCC is owned by the world's governments, the same governments who negotiated the agreement reached in Paris. The

'inter-governmental' nature of the IPCC is one of the key reasons why the IPCC has been lauded by so many as being successful and influential[3,4]. Its reports are 'listened to' by governments when engaged in geopolitical negotiations in ways that national science academies or independent assessments might not be. So it may be that the IPCC responds enthusiastically to the UNFCCC's request.

An alternative, but also legitimate, response would be for the IPCC to state that they cannot prepare such a report, or at least not yet. This might be for two reasons: that the UNFCCC's questions are ill-posed, and that there just isn't the knowledge yet available to allow for such an assessment to be compiled and published by 2018.

There are two analytical approaches the IPCC could adopt as it attempts to identify the impacts of 1.5°C warming, neither of which may yield a meaningful answer. Given that global warming has already touched 1°C above pre-industrial, the question might become 'What are the impacts *relative to today* of another 0.5°C of warming?' Alternatively the question might be framed in terms of the damages avoided by limiting warming to 1.5°C *relative to 2°C*. Either way, the answers crafted by an IPCC report may be well short of being robust. Although a differential of 0.5°C of *global* warming might be significant, when this is deconstructed into changes in regional weather and ecological and economic impacts in specific places, the signal is likely to get lost in the noise of complex non-linear physical and social systems.

Concerns about insufficient published research are also legitimate. Few integrated analyses have been conducted of the technological, economic, social and cultural pathways to get to 1.5°C, or about the implications of a massive expansion of negative emissions technologies (Ref. 5 is an exception) or about the regional impacts of 1.5° warming. Under its existing mandate the IPCC has neither the authority nor the funding to commission new research; it can assess only existing (published) research. And it is likely to take longer than the 30 months available for new research addressing these two questions to be completed and published by scientists and then assessed by the IPCC.

Yet it seems unlikely that the new Chairman of the IPCC, Hoesung Lee, would resist the request being made. He has already laid out some of his ambitions for the IPCC over the next five years[6]. The thrust of his remarks is to move the IPCC away from assessing more Earth system science, instead prioritising solutions-oriented knowledge, focusing on economics, technology, development pathways, poverty reduction and climate finance. The report on 1.5°C warming invited by the UNFCCC for 2018 appears to match Lee's vision of an IPCC that more directly services the needs of governments.

What is the Role of Research?

There are wider questions raised by the UNFCCC's invitation concerning the nature of the relationship between the IPCC and climate researchers and between the political process and the IPCC. For instance, to what extent should climate researchers and research funders bend their research agendas, programmes and projects towards the types of short-term policy-oriented questions which emerge from negotiations such as those at Paris? It is one thing for the IPCC to comply, given its assessment process is subject to the oversight of

governments. It is quite another, however, for the diversity of climate research activities to be seemingly corralled into servicing a tightly determined political agenda.

There are many roles for climate research and knowledge production beyond servicing the needs of the IPCC. These include curiosity driven research, such as attempts to better understand the dynamics of the Earth system or processes of social and cultural change; inquiry and scholarship that challenges dominant assumptions about climate-society interactions and which offer alternative frames for thinking about policy interventions; research oriented towards decision-support for the large and diverse constituency of stakeholders beyond the state, as in support of climate services or city planning.

Knowledge that is directed to feed into high-level assessment functions such as the IPCC is only one application of climate research. For over 25 years the IPCC has exerted a strong influence over scientific priorities and practice in climate research, shaping agendas and funding, driving career paths, influencing publication strategies and citation patterns. But the IPCC is not the only 'game in town'. Around the world, there are growing numbers of other organisations and authorities wanting to benefit from the capacities of climate researchers.

Organising Science-Policy Interactions

Nevertheless, the organisation of international science-policy interactions in the context of the geopolitics of the United Nations remains important. Different national political cultures manage in different ways the entanglement of knowledge and values, or what Edenhofer and Kowarsch describe as the relationship between "cartographers and navigators"[2]. In the UK, for example, the Haldane principle - the idea that decisions about what to spend research funds on should be made by researchers rather than politicians - remains more or less intact. Elsewhere, for example in India or China, investments in science are more directly influenced by government priorities. The Future Earth initiative, operating transnationally, offers a different model of multi-stakeholder knowledge co-production[7].

The IPCC increasingly finds itself caught in no-man's land, operating under a singular regime yet trying to fulfil multiple functions and meet different expectations. Requests to the IPCC such as this new one from the UNFCCC will draw attention to some of the structural and procedural limitations of its rigid and unreflexive configuration, as several commentators have recently observed[3,8,9].

I have previously suggested that the function of the IPCC be dissembled into three different roles, each operating under different governance arrangements and with different assessment protocols: a Global Science Panel, a series of Regional Evaluation Panels and a Policy Analysis Panel[10]. The latter would have a more proactive capability, with interdisciplinary skills and diverse analytical capacities. Such a capability would be better placed to respond to this request for a 2018 report and offer the 'pragmatic-enlightened model' of knowledge-policy assessment called for by Edenhofer and Kowarsch[2].

The world of policy-making and implementation is not the world of scientific rationality[11]. While it is quite legitimate for the UNFCCC to ask the IPCC to evaluate the implications of a 1.5°C warming target, climate researchers and the IPCC need to understand the political reasons for such a request. They should be cautious and not naively be drawn into undertaking new cycles of studies in the expectation that they will make a difference to the world of politics[12,13,14]. Rather, limited time and resources would be better deployed in designing more flexible mechanisms for science-policy interaction and pursuing more pragmatic and decision-centred applications of climate research.

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